REMARKS/ARGUMENTS

Claims 1-25 are pending, and stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Beintner et al. (US 6,566,228).

Applicants would like to thank Examiner Nguyen and Examiner W. David Coleman for the courteous telephone interview extended to Applicants' counsel, Chun-Pok Leung, on July 26, 2005. During the telephone interview, the Examiners agree with counsel that certain limitations of the independent claims are not taught in Beintner et al. (e.g., performing a plasma-enhanced chemical vapor deposition (PECVD) process without bias sputtering, with tetraethylorthosilicate (TEOS) as a gas source at a temperature of about 440°C to about 520°C to deposit an oxide layer on the bottom and sidewall of said trench structure and said semiconductor substrate, the oxide layer only partially filling the trench). The Examiners indicate that the current rejection will be reconsidered and either another non-final office action or a notice of allowability will be mailed.

The following sets forth the basis for the inadequacies of Beintner et al. used in the rejection. Applicants respectfully submit that independent claims 1, 11, and 21 are patentable over Beintner et al. because, for instance, Beintner et al. does not teach or suggest performing a plasma-enhanced chemical vapor deposition (PECVD) process without bias sputtering, with tetraethylorthosilicate (TEOS) as a gas source at a temperature of about 440°C to about 520°C to deposit an oxide layer on the bottom and sidewall of the trench structure and the semiconductor substrate, the oxide layer only partially filling the trench; and removing, using a single etching process, the oxide layer on the sidewall of the trench structure substantially completely and the oxide layer on the bottom of the trench structure partially to define a remaining oxide layer as the bottom oxide layer.

The Examiner alleges that Beintner et al. discloses at column 8, lines 52-60 and Figure 32 performing a plasma-enhanced chemical vapor deposition (PECVD) process without bias sputtering, with tetraethylorthosilicate (TEOS) as a gas source at a temperature of about 440°C to about 520°C to deposit an oxide layer on the bottom and sidewall of the trench structure

and the semiconductor substrate, the oxide layer only partially filling the trench. Applicants note, however, that:

(1) Beintner et al. specifically discloses the use of "high-density plasma CVD (HDP-CVD) process" at column 8, lines 52-54, not a plasma-enhanced chemical vapor deposition (PECVD) process without bias sputtering;[1] and

(2) Beintner et al. does not teach tetraethylorthosilicate (TEOS) as a gas source at a temperature of about 440°C to about 520°C to deposit an oxide layer on the bottom and sidewall of the trench structure and the semiconductor substrate.

As pointed out in the specification, "the conventional HDP-CVD process is limited by equipment and requires a higher cost. The methods according to embodiments of the present invention avoid these problems. Therefore, the present invention not only saves cost and time, but also allows the thickness of the bottom oxide layer to be controlled more easily." Specification at paragraph [0023] (page 6, lines 15-18). " By performing the PECVD-TEOS process at a temperature of about 440°C to about 520°C, preferably about 440°C to about 480°C, the reaction speed of the molecules of the TEOS will be increased so as to have a ratio of the thickness of the oxide layer 34 deposited on the bottom (bt) of the trench structure 33 to that on the sidewall (sw) of the trench structure 33 between about 1.5 and about 2.3." Specification at paragraph [0017] (page 4, line 31 to page 5, line 4). This allows the use of a single etching process to remove the oxide layer on the sidewall of the trench structure substantially completely and the oxide layer on the bottom of the trench structure partially to define a remaining oxide layer as the bottom oxide layer.

Although the use of TEOS or LPTEOS is mentioned in Beintner et al. at column 3, lines 56-61, it is used for forming a first oxide hard mark 13, which is different from an oxide layer formed on the bottom and sidewall of a trench structure as recited in the claims. As

[1] It is commonly known that PECVD refers to plasma-enhanced CVD without bias sputtering, while HDP-CVD refers to high density plasma CVD with bias sputtering. See, e.g., U.S. Patent No. 6,410,446 at column 2, lines 3-6, 17-21, and 56-61; U.S. Patent No. 6,562,731 at column 1, lines 55-61; and column 2, lines 4-18. The present application also distinguishes the two CVD processes (specification at page 1, line 17 to page 2, line 19). To more particularly point out and distinctly claim the invention, Applicants have amended independent claims 1, 11, and 21 to recite performing a plasma-enhanced chemical vapor deposition (PECVD) process without bias sputtering..

discussed above, the relevant portion of Beintner et al. at column 8, lines 52-54 discloses the use of HDP-CVD process to deposit an oxide fill 22. It fails to teach or suggest the features recited in independent claims 1, 11, and 21.

For at least the foregoing reasons, claims 1, 11, and 21, and claims 2-10, 12-20, and 22-25 depending therefrom are novel and patentable.

CONCLUSION

In view of the foregoing, Applicants believe all claims now pending in this Application are in condition for allowance. The issuance of a formal Notice of Allowance at an early date is respectfully requested.

If the Examiner believes a telephone conference would expedite prosecution of this application, please telephone the undersigned at 650-326-2400.

Respectfully submitted,

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